

# A theory of Lexical Event Structures and its cognitive motivation

*Stefan Engelberg*

## 1. Introduction

The rise of event semantics in many domains of formal semantics like tense, aspect, quantification, adverbial modification, etc. has had an obvious impact on the semantic translation of verbs: verbs are represented as having a referential event argument in addition to their thematic arguments. This, in turn, forces lexical semantic theories to recur to this event argument in their semantic representations of verbs. Among the various lexical semantic approaches, the ones that assume that event structures constitute the nucleus of a verb's meaning probably deviate the most from earlier approaches to verb meaning based on theta roles or decompositions. The development of such a theory of Lexical Event Structures as meaning representations for verbs is the topic of this paper. This venture is motivated by the demand for an adequate lexical counterpiece to sentential event semantics. It aims at developing a theory with a greater breadth of empirical coverage than is achieved by theories mainly concerned with linking. Furthermore, this undertaking is guided by the conviction that lexical semantics needs a more solid cognitive foundation to yield empirically contentful semantic representations. Thus, the questions to be answered in this paper are: how do we conceptualize events and how is this reflected in the grammatical and semantic behavior of the verbs denoting these events?

The paper will give a concise account of the theory of Lexical Event Structures. The paper has three objectives which correspond to the following three sections. In section 2 I will sketch the theory and discuss the empirical goals the theory pursues (section 2.1) and the semantic components Lexical Event Structures consist of (section 2.2). Section 3 is devoted to linguistic phenomena whose explanation depends on Lexical Event Structures. In section 3.1 I will briefly illustrate in how far Lexical Event Structures are related to phenomena from five central empirical domains of lexical semantics and in section 3.2 it will be shown how Lexical Event Structures function

in a linking theory. Section 4 aims to show how the central semantic concepts in Lexical Event Structures can be anchored to concepts which are well-founded in cognitive science. Section 4.1 discusses the event concept employed and illustrates the relation between the perception of movements and the use of verbs of movement. Section 4.2 deals with the concept of volition with respect to the licensing conditions for intransitive verb passives. In section 4.3 the distinction between durativity and punctuality, which has proven relevant for a number of verb semantic phenomena, is tied to the way we perceive events and structure our own actions. Section 5 provides a conclusion.<sup>1</sup>

## 2. Lexical Event Structures

### 2.1. Empirical issues

If one proposes a theory on how a verb's meaning shall be represented, it seems worthwhile to spend a few thoughts on how such a theory and the particular meaning representations are empirically justified. Most lexical semantic theories that have been developed especially to capture verb meanings deal primarily with the question how a verb's meaning determines the syntactic surrounding it occurs in. Starting from this particular research interest, it seems that it is often assumed that the main justification for the semantic representation proposed comes from syntactic data. This conception, I think, is misleading (cf. Engelberg 2000a, 2001).

Let us assume that a linguistic expression *LE* is assigned the lexical semantic representation *SEM* as in (1a) and is claimed to occur with case patterns (or in syntactic configurations) as represented in the morphosyntactic representation *SYN* in (1b). Let's further assume that a linking rule like (1c) is postulated.

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<sup>1</sup> This paper reports on one of the central topics of the research project "Valency in the Lexicon" (part of the project cluster SFB 282 "Theory of the Lexicon"), headed by Joachim Jacobs, and with Kerstin Blume, Ingrid Kaufmann, Ulrich Klein, and Barbara Lenz as collaborators. The project was also concerned with the processing of valency information, the lexical representation of non-obligatory arguments, marked syntactic valencies, and the valency of nominalized infinitives.

- (1) a. SEM:  $\text{PRED}^A(x, \text{PRED}^B(y, z))$   
 b. SYN:  $\text{case}^1, \text{case}^2, \text{case}^3$  (or  $[\text{NP}^1 [\text{NP}^2 \text{NP}^3]]$ )  
 c. Linking: If the semantic representation of a lexeme is *SEM*, then *y* is assigned  $\text{case}^2$  (or, respectively, *y* enters the syntactic structure as  $\text{NP}^2$ ).

Now, if we want to check whether the statement in (1c) is true, we have to check whether (1a) is the case, whether (1b) is the case and whether the conditional in (1c) is borne out by the data. In order to check (1a) we indisputably have to know how *SEM* is to be interpreted. Only if this is sufficiently clear does a statement like (1c) have any empirical content. This is even more important if a theory is assumed that claims that statements like (1c) are based on a general homomorphism from lexical semantic onto syntactic structures. Theories of this kind are often particularly susceptible to circular argumentations in just imposing syntactic structures onto semantic ones.<sup>2</sup>

To assign a semantic representation *SEM* to a certain linguistic expression *LE* is to claim that *LE* corresponds to some configuration in the world we talk about. In this sense *SEM* is a description of the world on a certain level of abstraction. In order to check the correctness of an assignment of *SEM* to *LE* we at least have to check whether *LE* is indeed about the aspects of the world described in *SEM* and in order to do that we must of course know what *SEM* is supposed to convey about the world. The interpretation of *SEM* is based on the assignment of individual variables to entities and on truth conditions for the predicates, relations and operators used in *SEM*. On this basis, the meaning of complex expressions is computed from that of its parts and the way they are combined. While on the one hand those concepts used in *SEM* which are traditionally employed by sentential semantics – propositional relators, quantifiers, temporal operators, etc. – have been provided with fairly precise truth conditions, predicates like *SEAFOOD*, *FLABBERGASTED* or *CELEBRATE* are rather taken at their face value. Fortunately, we

<sup>2</sup> It should be noted that while I assume that the structure of the entities verbs refer to greatly matters for lexical semantics I do not exploit any alleged homomorphic correspondence between the structural aspects of lexical meaning and syntactic structures. I wouldn't categorically exclude that such structural correspondences exist although I doubt that it is as often the case as has been suggested in verb semantics. This paper is simply not about syntax-semantic interfaces of this sort. It neither requires such structural similarities nor is it incompatible with them.

can often be quite generous with respect to what these predicates mean exactly, as long as it has no impact either on semantic composition or on the lexical-semantic licensing of syntactic or semantic phenomena. But this is of course different with respect to those “soft” lexical concepts like ‘agent’, ‘event’, ‘volition’, ‘causation’ which occur in lexical decompositions or meaning postulates and which on the one hand seem to elude the assignment of precise truth conditions, but on the other hand are used to make strong claims about the syntactic and semantic behavior of lexemes. Anyhow, it cannot be overlooked that lexical semantics has often shied away from giving a clear account of such basic semantic concepts. Thus, they remain quite shapeless, such that theories that employ these concepts are easily immunized against falsification. In other words, the empirical content of a lexical semantic theory is proportional to the degree of exactness with which the truth conditions for their basic predicates are given.

One might of course object to this demand by claiming that it is so obvious who the agent and who the patient is in *Mary hit John* that any answer to the question what AGENT and PATIENT mean wouldn’t challenge our semantic representations anyways. But, firstly, to pursue its goals a theory is obligated not only to use intuitively clear concepts but also to explicate them. And secondly, there are numerous cases in which our ignorance of the meaning of semantic termini obviously obstructs progress in the field. Psych-verbs and the question in how far agentivity and causation are involved in their meaning (with numerous consequences for predictions about their syntactic behavior) constitute one out of many examples. As long as it is not sufficiently clear what CAUSE stands for, one might argue that in both *fear* and *frighten* causation is at stake (with the stimulus being the causer; e. g. Dowty 1991: 579) or that only *frighten* involves causation (e. g. Grimshaw 1990: 22) – whatever suits the theory and allows for the desired prediction about the mapping of arguments into syntax.

What needs to be done to make progress in explicating our basic semantic concepts? I adhere to the not uncontroversial but quite unspectacular epistemological view that our experience and knowledge of the world is mediated by our cognitive predispositions. Under this moderate realistic view, the entities linguistic expressions are about are entities in this cognitively mediated world. If semantic representations are representations of the world we talk about, then we should find ample evidence for the nature of the entities and predicates employed in our semantic representations in the domain of those cognitive sciences which are devoted to research on the way we experience the world. In section 4 I will firstly show that this expectation is

not unfounded and secondly that there is linguistic evidence that the world as cognitively mediated is indeed the world linguistic expressions are about.

While a theory that does not provide truth conditions for the semantic predicates it employs has no empirical content, a theory that cannot account for the syntactic or semantic effects a verb has is linguistically insufficient. This conviction explains how the efforts in developing a theory on Lexical Event Structures have been distributed. Besides the search for a cognitive foundation for the basic semantic concepts, the aim of our research into verbs and events was to show that Lexical Event Structures provide the right conceptual grounding for the explanation of a wide range of syntactic and semantic phenomena. The empirical coverage of Lexical Event Structures encompasses phenomena in the following five domains, which I consider to be the central domains of lexical semantics (historical and acquisitional phenomena aside):

- (i) *Semantics-syntax mapping*: Semantic properties of verbs determine to a large degree the syntactic realization of arguments and the ability to take part in valency alternations, resultative constructions, etc.
- (ii) *Selectional restrictions*: The combination of a verb with other lexemes is subject to certain semantic restrictions. This concerns the co-occurrence of particular adverbials or derivational morphemes with certain classes of verbs on the one hand and verb-dependent restrictions on the NPs filling argument positions on the other.
- (iii) *Grammatical-categorical restrictions*: Verbs are semantically classified with respect to their ability to allow the expression of progressive aspect, imperative, particular voices or other contrasts of grammatical categories.
- (iv) *Interlexematic relations*: Verbs stand in semantic relations to each other, such as antonymy, hyponymy or synonymy.
- (v) *Inference behavior*: Semantic properties of verbs influence the inference behaviour of lexical items in complex expressions. In particular, there are lexically-based inference peculiarities that show up in regular alternations of sentence patterns such as in diatheses, or when the tense or grammatical aspect of the sentence is changed. E. g., inferences about the internal temporal structure of an event expressed by the simple form of a verb might carry over to the progressive form of the verb or not, depending on particular lexical verb semantic properties.

## 2.2. Sketch of a theory of Lexical Event Structures

The mereological structure of an event, its temporal properties, and the kind of involvement of participants in the event lie at the core of the theory that I will refer to as ‘Lexical Event Structure Theory’.<sup>3</sup> Its basic idea is that the meaning of a verb is to be represented as a Lexical Event Structure (LES) which has the following characteristics:

- (i) *Complexity of events*: Verbs refer to events that are internally structured in the sense that they can consist of different subevents ( $e^1$ ,  $e^2$ , ...) and possibly a state ( $s$ ).
- (ii) *Sorts of subevents*: The subevents are durative ( $e^{\text{DUR}}$ ) or punctual ( $e^{\text{PCT}}$ ).
- (iii) *Relations between subevents*: Subevents stand in temporal relations to each other, e. g., a subevent  $e^1$  can precede a subevent  $e^2$  completely ( $e^1 < e^2$ ), or  $e^1$  can overlap with  $e^2$  ( $e^1 \circ e^2$ ) (cf. for details Engelberg 2000a, 2004).
- (iv) *Participation in subevents*: The event participants which correspond to the arguments of the verb are not necessarily involved in all subevents, but rather only in some of them; semantic functions like CONTROL, MOVE, VOLITION etc. relate participants and subevents.
- (v) *Implication vs. presupposition*: The occurrence of a subevent is either entailed ( $\rightarrow_I$ ) or presupposed ( $\rightarrow_P$ ) by the open proposition in the semantic translation of the verb, i.e. by an expression like “VERB( $x, y, e$ )”.

This basic idea is illustrated by the following examples of the German verbs *abtrocknen* ‘dry off’, *fahren* ‘drive’, *erschießen* ‘kill by shooting’, and *fangen* ‘catch’.

The two-place verb *abtrocknen* ‘to dry off’ refers to a complex event where the first subevent  $e^1$  has a certain duration (“DUR”), i. e., is not punctual, and involves two participants, an agent and a patient. In *Ron hat den Bierkrug abgetrocknet* ‘Ron dried off the beer mug’,  $e^1$  is Ron’s acting upon the beer mug (probably with a towel). Almost simultaneously (“o”), a second durative event  $e^2$  occurs which only involves the patient, namely the beer mug becoming dry. This results in a following (“<”) state  $s$  of the beer

<sup>3</sup> This section is a slightly modified version of section 2.2 in Engelberg (2004). The relation to other theories of lexical semantics like those by Pustejovsky (1991) and Wunderlich (1996, 1997) is not touched on in the present paper. The reader is referred to Engelberg (2000a, 2001, 2004).

mug being dry. This is captured in the Lexical Event Structure (LES) of *abtrocknen* as in Lex 1. For simplicity, I will not list the particular semantic relations in most of the following representations, but just speak of agents and patients in a very unspecific way. I assume that these thematic relations are derived from more basic relations like 'volition', 'change', etc. within a prototype theory of thematic roles (cf. Dowty 1991; Blume 2000: 119ff; Engelberg 2000a: 156ff).

<i>abtrocknen</i>	SEM: $\lambda y \lambda x \lambda e [\text{ABTROCKN}(x, y, e)]$
	LES: $(\rightarrow_I e^1[+\text{DUR}]; x^{\text{AGENT}}, y^{\text{PATIENT}}) \circ (\rightarrow_I e^2[+\text{DUR}]; y^{\text{PATIENT}})$ $< (\rightarrow_I s: y^{\text{PATIENT}})$

*Lex 1.* Lexical entry for German transitive *abtrocknen* 'dry off'.

The causative but non-resultative verb *fahren* 'to drive', as in *sie fuhr ihren neuen Volkswagen* 'she drove her new Volkswagen', requires a structure similar to causal resultatives like *abtrocknen* with the difference that it lacks a result state in its non-directional variant:

<i>fahren</i>	SEM: $\lambda y \lambda x \lambda e [\text{FAHR}(x, y, e)]$
	LES: $(\rightarrow_I e^1[+\text{DUR}]; x^{\text{AGENT}}, y^{\text{PATIENT}}) \circ (\rightarrow_I e^2[+\text{DUR}]; y^{\text{PATIENT}})$

*Lex 2.* Lexical entry for German transitive *fahren* 'drive'.

While the event structure properties of causative *erschießen* 'kill by shooting', as in *die Miliz erschoss den Demonstranten* 'the militia shot (and killed) the demonstrator', are similar in many respects to those of verbs like *abtrocknen* 'to dry off', *erschießen* implies a different temporal relation between the causing and the caused subevent, since the causing subevent completely precedes the caused one, in contrast to *abtrocknen*. Furthermore, at least the first subevent is punctual:

<i>erschießen</i>	SEM: $\lambda y \lambda x \lambda e [\text{ERSCHIESS}(x, y, e)]$
	LES: $(\rightarrow_I e^1[+\text{PCT}]; x^{\text{AGENT}}, y^{\text{PATIENT}}) < (\rightarrow_I e^2: y^{\text{PATIENT}})$ $< (\rightarrow_I s: y^{\text{PATIENT}})$

*Lex 3.* Lexical entry for German transitive *erschießen* 'kill by shooting'.

Finally, the verb *fangen* ‘to catch’, in the sense of ‘catch a flying object’, as in *sie fing den Ball* ‘she caught the ball’, is distinct from the verbs above due to the presupposed rather than implied occurrence of the first subevent, i. e., we can still infer from the negated sentence *sie fing den Ball nicht* ‘she didn’t catch the ball’ that the ball was flying:

<i>fangen</i>	SEM: $\lambda y \lambda x \lambda e [FANG(x, y, e)]$
	LES: $(\rightarrow_P e^1; y^{PATIENT}) < (\rightarrow_I e^{2[+PCT]}; x^{AGENT}, y^{PATIENT})$
	$< (\rightarrow_I s; x^{AGENT}, y^{PATIENT})$

Lex 4. Lexical entry of German transitive *fangen* ‘catch’.

Lex 1 through Lex 4 are shorthand notations for more explicit semantic representations in which meaning postulates (MP) take the open proposition of the verb’s translation,  $VERB(x, y, e)$ , as an antecedent and the different information parts of LES as a consequent. These parts include the information about immediate subevents in the form of a mereological condition, e. g.,  $e^1 \subseteq_{imm} e$ ,<sup>4</sup> the sort of each subevent as a one-place predicate, e. g.,  $PCT(e^1)$ , the semantic relations as two-place predicates between event participants and subevents, e. g.,  $CONTROL(x, e^1)$ , and the temporal relations as two-place relations between subevents, e. g.,  $e^1 < e^2$ . In addition, more specific information about the subevents can be given, e. g., that the first subevent of *fangen* ‘catch’ in Lex 4 is a flying or moving away of something and the first subevent of *fahren* in Lex 2 involves the agent operating the mechanisms and controls of the patient and directing its course. This specific information – although part of the meaning of the lexical item – is not crucial for the explanation of the semantic and syntactic phenomena we are interested in. Thus, the shorthand notation of *fahren* ‘drive’ in Lex 2 can be obtained from the full-blown representation in Lex 5.

Lex 5 also contains information about dependency relations between subevents like causation which are omitted in the short-hand notations because they don’t play a role in the explanation of the phenomena discussed in later sections of this paper. Three remarks are in order here with respect to dependency relations: (i) Every temporal relation within a Lexical Event Structure is accompanied by a dependency relation. Verbs do not denote events whose subevents are merely temporally connected. (ii) Causation is

<sup>4</sup> The idea of what it means for a subevent to be an immediate subevent is elaborated in Engelberg (2004).



*fahren*

SYN: V, /acc/nom

SEM:  $\lambda y \lambda x \lambda e [\text{FAHR}(x, y, e)]$ MP-I-*fahren*:  $\Box \forall y \forall x \forall e [\text{FAHR}(x, y, e) \rightarrow_P$ (selectional restrictions:) ANIMATE(x) &  
VEHICLE(y) & ... ]MP-II-*fahren*:  $\Box \forall y \forall x \forall e [\text{FAHR}(x, y, e) \rightarrow_I \exists e^1 \exists e^2 [$ (subevents:)  $e^1 \sqsubseteq_{\text{imm}} e$  & $e^2 \sqsubseteq_{\text{imm}} e$  &(sort of subevents:) DUR( $e^1$ ) &  
DUR( $e^2$ ) &(temporal relations:)  $e^1 \circ e^2$  &(causation:) CAUSE( $e^1, e^2$ ) &(semantic relations:) CONTROL(x,  $e^1$ ) &  
MOVE(y,  $e^2$ ) & ...(specific information:) OPERATE-MECHANISMS&CONTROLS-  
AND-DIRECT-COURSE(x, y,  $e^1$ ) & ... ]]

Lex 5. Lexical entry (full-blown version) for German transitive *fahren* 'drive' (for the 'SYN' information cf. section 3.1).

not the only dependency relation involved in verb semantics. The two immediate subevents of *abtrocknen* 'dry off', namely the acting upon the mug and the becoming dry of the mug, stand in a typical causal relation. Other verbs like *vergeben* 'forgive', *gehorschen* 'obey', *folgen* 'follow' or *nachgeben* 'give in' imply relations which are more similar to concessive or explanatory relations as expressed by conjunctions like *although* or *because* (cf. Blume 2000: 167).<sup>5</sup> If Rebecca forgives Rudolph, that means she decided to no longer be upset with him ( $\rightarrow_I e^2$ ), although he did something mean to her ( $\rightarrow_P e^1$ ). If Rebecca obeys Rudolph she displayed a certain behavior ( $\rightarrow_I e^2$ ) because (among other things) Rudolph told her to do so ( $\rightarrow_P e^1$ ). Furthermore, in Engelberg (2005) it is argued that another non-causal dependency relation, namely supervenience, is involved with a number of verbs like *help*,

<sup>5</sup> These relations are probably better conceived of as relations between propositions or facts about these subevents. As with causation, I will not discuss their semantics here. Notice that non-causal dependency relations only occur between a presupposed and an implied subevent, but not between two implied subevents.

*endanger, facilitate*. Supervenience is a counterfactual relation that holds between expressions like *Rebecca helped Jamaal* and *Rebecca fixed Jamaal's computer* where the event expressed in the second expression, so to speak, instantiates the event expressed in the first event without being identical to it. (iii) In contrast to the original version of the event structure theory (Engelberg 2000a) I now tend to grant the different dependency relations a more important role in licensing certain constructions. Supervenience might be involved in licensing sentential subjects as in *that he did that helped us a lot* and verbs expressing concessive, explanatory, and similar relations show a striking proneness to mark their objects with dative case.

As with dependency relations, it also holds for temporal relations that verbs referring to complex events always impose temporal restrictions on the relation between the subevents. That is to say, there are no verbs that imply the occurrence of several subevents and / or a state but do not imply a particular temporal relationship between them.

### 3. The licensing of semantic and syntactic structures

#### 3.1. Lexical Event Structures and semantic restrictions

I assume that Lexical Event Structures are the core part in the lexical semantic representation of verbs, which underlies the behavior of verbs in the five empirical domains mentioned in section 2.1. Other elements of the meaning of a verb are considered irrelevant for these phenomena. While it is part of the meaning of *to cough* both that it is punctual and that it involves an expulsion of air only punctuality is crucial in the explanation of the verb's grammatical and semantic behavior while the implied expulsion of air is not. In the following I will provide examples from each of the five empirical domains and show how they depend on distinctions provided by Lexical Event Structures.

##### 3.1.1. Semantics-syntax mapping

Besides the role Lexical Event Structures play in a general approach to linking, which will be dealt with in section 3.2, a number of semantically motivated valency alternations have been treated on the basis of event structure representations. One of them is the alternation in (2) between an accusative NP in German and a PP headed by the preposition *an* 'at', which is said

to introduce a partitive meaning (cf. Krifka 1989; Filip 1989; Engelberg 1994). In particular, this alternation points to the relevance of a distinction between durative and punctual events.

- (2) a. Rebecca baute einen Schuppen / an einem Schuppen.  
 Rebecca built a.ACC shed / at a.DAT shed  
 approximately: 'Rebecca built / was building a shed.'  
 b. Rebecca streichelte ihren Leguan / \*an ihrem Leguan.  
 'Rebecca petted / was petting her iguana.'  
 c. Rebecca sprengte die Brücke / \*an ihrer Brücke.  
 'Rebecca blew up / was blowing up the bridge.'  
 d. Rebecca kniff ihren Freund / \*an ihrem Freund.  
 'Rebecca pinched / was pinching her boyfriend.'

As the examples in (2) show, it is only a subclass of transitive verbs like those in (3a) that allow the *an*-construction, while other transitive verbs do not (3b).

- (3) a. *an*-construction possible: *waschen*, 'wash'; *schreiben*, 'write'; *bügeln*, 'iron'; *reparieren* 'fix'<sup>6</sup>; *stricken*, 'knit'; *manipulieren*, 'manipulate'; *kochen*, 'cook'; *rechnen*, 'calculate'; *nähen*, 'sew'.  
 b. *an*-construction not possible: *kennen*, 'know'; *quälen*, 'tease / torture'; *photographieren*, 'photograph'; *sehen*, 'see'; *sprengen*, 'blow up'; *stehlen*, 'steal'; *lösen*, 'solve'.

The *an*-alternation turns out to be restricted to verbs which express an event of a certain duration that leads to a result state (2a). Neither durative verbs without a result state (2b) nor punctual verbs either with (2c) or without a result state (2d) are admissible here.<sup>7</sup>

<sup>6</sup> The *an*-construction is particularly often found with verbs of creation like *bauen* 'build', *schreiben* 'write', etc., but examples for verbs of change of state like *reparieren* 'fix' are also attested: *Musste zwar etwas warten, weil der Chef gerade Kundschaft hatte, er reparierte an einem C5, wurde aber gefragt, ob ich Kaffee möchte* 'Had to wait a little bit, because the boss had a client, he "fixed at a" C5, but was asked if I would like a coffee' (from the internet).

<sup>7</sup> There is also a morphological restriction, in that derived verbs do not take part in the alternation, i. e. verbs converted from adjectives (*trocknen*, 'to dry'), prefixed verbs (*ver|nähen*, 'to close by sewing'), and verbs with separable particles (*her|stellen*, 'to produce'). That morphological restrictions are involved also points to the lexical nature of this valency alternation.

It should be noted that the two interpretations of *bauen* in (2a) – the completive and the partitive one – do not require two different Lexical Event Structures for *bauen*. Since verbs are subject to the influence of grammatical aspect and aspectual meanings can have a modal component, the result state within an LES can be within the scope of a modal operator which renders the result state as just possibly obtaining. This has been argued for with respect to the progressive in Engelberg (2002b).

Other phenomena within the domain of valency alternations that have been discussed within this approach are the intransitive verb passive (cf. section 4.2.), the realization of the agent in German passive constructions which use *bleiben* ‘remain’ as an auxiliary (cf. Engelberg 2004), and causativization processes with verbs denoting sounds and noises (cf. Engelberg 2000a: 288ff).

### 3.1.2. *Selectional restrictions*

Adverbial modification of verbs requires the right semantic representation of verbs insofar as many adverbials semantically select verbs that denote events of a particular kind. Moreover, a theory that assumes verbs to refer to structured events suggests that adverbials are attracted to particular sub-events. That will be illustrated by two examples. The first one, which is taken from Engelberg (2000b), starts from the observation that German has two temporal-aspectual adverbials corresponding to English PPs of the type *for five minutes*, namely *fünf Minuten lang* (literally “five minutes long”) and *für fünf Minuten* (literally “for five minutes”). The latter is particularly interesting since it shows that the involvement of event participants in particular subevents plays a crucial role. A corpus-based investigation revealed that, firstly, the *für*-PP in by far the most cases refers to a result state of an event and, secondly, that in almost all cases, the *für*-PP occurs if the result state is controlled by the agent as in the examples (4a) and (4b) where ‘for’ is intended to refer to the length of the result state and not the preceding activity.<sup>8</sup> If demonstrators block a street (4a), the result state of the street being

<sup>8</sup> The notion of controlled states seems to play a role in other domains, too. In a study on nominalized infinitives in German, Blume (2004: 112) observed that verbs denoting states allow nominalized infinitives only if these states are controlled by an animate participant. Similarly, the realization of an agent with certain kinds of stative passives requires agentive control over an result state (cf. Engelberg 2004).

blocked will hold as long as the demonstrators maintain this state, while the state that results from loosing a key (4c) is not controlled by the agent.

- (4) a. Sie blockierten die Straße für eine Stunde.  
 'They blocked the street for one hour.'  
 b. Sie besetzten die Fabrik für drei Tage.  
 'They occupied the factory for three days.'  
 c. ?? Sie verlor den Schlüssel für einige Minuten.  
 'She lost the key for five minutes.'  
 d. ?? Sie aß den Apfel für eine Stunde.  
 'She ate the apple for one hour.'

This restriction is captured in lexical entries like Lex 6:

<i>besetzen</i>	SEM: $\lambda y \lambda x \lambda e [\text{BESETZ}(x, y, e)]$
	LES: $(\rightarrow_I e^1: x^{\text{AGENT}}, y^{\text{PATIENT}})$
	$< (\rightarrow_I s: x^{\text{AGENT}}(\text{CONTROL}, \dots), y^{\text{PATIENT}})$

Lex 6. Lexical entry for German transitive *besetzen* 'occupy'.

As (4) has shown, adverbials are sensitive for the distinction between process-like and stative parts of the event. Similarly, in cases where a verb refers to an event with two non-stative subevents, adverbials usually clearly relate to one of them. In the following example (from Engelberg 2004) each of the two adverbial PPs headed by *mit* 'with' is related to a different part of the event, as the respective implications show.

- (5) a. Otto fuhr den Wagen mit großem Vergnügen.  
 'Otto drove the car with great pleasure.'  
 implies: Otto was doing something with great pleasure.  
 does not imply: The car was moving with great pleasure.  
 b. Otto fuhr den Wagen mit Höchstgeschwindigkeit.  
 'Otto drove the car at highest speed.'  
 does not imply: Otto was doing something at highest speed.  
 implies: The car was moving at highest speed.

If we assume that there are two subevents involved here (cf. Lex 2, section 2.2), namely a causing subevent  $e^1$  (Otto operating the car) and a caused

subevent  $e^2$  (the car moving), the difference between (5a) and (5b) finds an explanation. The first adverbial, *mit großem Vergnügen* ‘with great pleasure’, modifies  $e^1$ , and the second one, *mit Höchstgeschwindigkeit* ‘at highest speed’, modifies  $e^2$ . This relativization with respect to subevents is grounded in selectional restrictions. The adverbial *mit großem Vergnügen* only modifies (sub)events with an animate participant, while *mit Höchstgeschwindigkeit* in the context of movements is more likely to occur with inanimate event participants. This behavior of adverbials, in particular manner adverbials, can be generalized: an event adverbial can modify any subevent whose occurrence is implied by the verb – i. e. presupposed subevents are not modifiable – and which satisfies the selectional restrictions of the adverbial.

### 3.1.3. Grammatical-categorical restrictions

The formal contrasts within most grammatical categories can be systematically expressed with all words of the part of speech they are defined for, e. g. with respect to tense each verb can occur in past, present or future tense if a language has grammatical markers for these contrasts. Some grammatical categories, though, employ contrasts that are restricted to a subset of the lexemes of the respective part of speech. This holds for plural as an expression of the grammatical category number, for progressive as one of the aspects or passive within the category of voice. In most cases lexical semantic properties are responsible for these restrictions. Thus, Lexical Event Structures should capture these properties, which they do, as will be shown for lexical restrictions concerning the progressive (cf. Engelberg 2004). Leaving aside restrictions on stative verbs for the moment, an observation which points to the importance of both the distinction between durative and punctual verbs and between presupposed and entailed subevents is the following: while all durative verbs (with and without result states) allow the progressive, for punctual verbs there are occurrence and interpretation restrictions. Firstly, punctual verbs can occur in the progressive if they are non-resultative; in this case they are interpreted iteratively (6). Secondly, punctual verbs that presuppose a preceding event occur in the progressive, as in (7), where it is presupposed that Rebecca participated in the race or was nearing the completion of her journey, respectively. In this case, the progressive sentence is related to the time of this preceding event. Finally, punctual verbs that do not belong to these two types – especially those that lead to

cognitive states – do not allow the progressive. This holds for *notice* and *astonish* in (8) which are resultative in the sense that once somebody has noticed something, he is aware of it, and once something has astonished somebody, he is in a state of surprise.

- (6) a. Rebecca was pinching Jamaal. (→ repeatedly)  
 b. Rebecca was hopping. (→ repeatedly)
- (7) a. Rebecca was winning the race.  
 b. Rebecca was arriving.
- (8) a. ??Rebecca was noticing that.  
 b. ??That was astonishing Rebecca.

The Lexical Event Structures of the three types of verbs display these properties, which license (Lex 7, 8) or do not license (Lex 9) the progressive.<sup>9</sup>

<i>hop</i>	SEM: $\lambda x \lambda e[\text{HOP}(x, e)]$
	LES: $(\rightarrow_1 e^1[+\text{PCT}]; x^{\text{AGENT}})$

*Lex 7.* Lexical entry for English intransitive *hop*.

<i>win</i>	SEM: $\lambda y \lambda x \lambda e[\text{WIN}(x, y, e)]$
	LES: $(\rightarrow_p e^1[+\text{DUR}]; x^{\text{AGENT}}, y^{\text{PATIENT}})$
	$< (\rightarrow_1 e^2[+\text{PCT}]; x^{\text{AGENT}}, y^{\text{PATIENT}})$

*Lex 8.* Lexical entry for English transitive *win*.

<i>notice</i>	SEM: $\lambda y \lambda x \lambda e[\text{NOTICE}(x, y, e)]$
	LES: $(\rightarrow_1 e^1[\text{PCT}]; x^{\text{AGENT}}, y^{\text{PATIENT}})$
	$< (\rightarrow_1 s; x^{\text{AGENT}}, y^{\text{PATIENT}})$

*Lex 9.* Lexical entry for English transitive *notice*.

<sup>9</sup> It would have to be shown that the arguments of *win* and *notice* in fact bear the roles indicated in their event structures. The *x* argument of *win*, for example, has sometimes been treated as non-agentive (e.g., Pustejovsky 1991: 61). I will not argue for any particular solution here, since the precise roles and the underlying semantic entailments are not relevant for the phenomena discussed.

## 3.1.4. Interlexematic relations

Semantic relations between lexemes like synonymy, antonymy or hyponymy, which I will call interlexematic relations, constitute the classical field for lexical semantics. Expressions like German *durchwaten* 'wade across' vs. *durchqueren* 'move across' (9) and French *verdir* 'color green' vs. *colorer* 'color' (10) stand in a relation of hyponymy. Every event of wading across (*durchwaten*) is an event of moving across (*durchqueren*), but not the other way around, and every event of coloring something green (*verdir*) is an event of coloring something (*colorer*), but not the other way around.

- (9) a. Rebecca durchquerte den See.  
'Rebecca moved across the lake / crossed the lake.'  
b. Rebecca durchwatete den See.  
'Rebecca crossed the lake by wading / waded through the lake.'
- (10) a. Jamaal a coloré le carré.  
'Jamaal colored the square.'  
b. Jamaal a verdi le carré.  
'Jamaal colored / made the square green.'

There is a crucial difference between these two pairs, though, which becomes obvious when we look at the event structures of the respective verbs. *Durchwaten* and *durchqueren* involve a process  $e^1$  that leads to the result state  $s$  of being across (Lex 10) and *verdir* and *colorer* involve a first subevent  $e^1$  where somebody causes a second subevent  $e^2$  of something changing its color with the result state  $s$  that the object has a new color (Lex 11).

<i>durchwaten</i>	SEM: $\lambda y \lambda x \lambda e [\text{DURCHWATEN}(x, y, e)]$
	LES: $(\rightarrow_1 e^1 [\text{DUR}], x^{\text{AGENT}}, y^{\text{PATIENT}})$
	$< (\rightarrow_1 s: x^{\text{AGENT}}, y^{\text{PATIENT}})$

Lex 10. Lexical entry for German transitive *durchwaten* 'wade through' (for  $e^1$  being the wading of  $x$  through  $y$ ).<sup>10</sup>

<sup>10</sup> In section 4.2 I will argue that we actually have to distinguish two agentive subevents with verbs of movement, a translatory movement (in (9) across the lake) and a relative movement (in the case of *durchwaten* the particular wading movements of the agent). This refinement does not affect the possibility of relativizing the interlexematic relations with respect to subevents.



<i>verdir</i>	SEM: $\lambda y \lambda x \lambda e [\text{VERDIR}(x, y, e)]$
	LES: $(\rightarrow_1 e^1: x^{\text{AGENT}}, y^{\text{PATIENT}}) \circ (\rightarrow_1 e^2: y^{\text{PATIENT}})$ $< (\rightarrow_1 s: y^{\text{PATIENT}})$

*Lex 11.* Lexical entry for French transitive *verdir* 'color / make green' (for *s* being the state of *y* having the color green).

For the *colorer-verdir* pair the hyponymy relation is related to the result state, since the result state of *verdir* is a specific case of the result state of *colorer*. By contrast, for the *durchwaten-durchqueren* pair the hyponymy relation is related to the agentive subevent, since the activity of *durchwaten* is a special form of *durchqueren*, while the result of being on the other side is the same for both verbs. By referring to structured events, we can refine and relativize the idea of hyponymy / hyperonymy as follows: (i) The verb *durchqueren* is a hyperonym of *durchwaten* with respect to the agentive subevent  $e^1$  because all properties of  $e^1$  which can be inferred from *durchqueren* can also be inferred from *durchwaten* with respect to its agentive subevent  $e'^1$ . It follows from *durchqueren* that the agent moves somehow in  $e^1$ . The same follows from *durchwaten* with respect to  $e'^1$ , but where *durchwaten* also implies that the agent moves in a way that he lifts his legs higher than one usually does when walking on solid ground. (ii) The verb *colorer* is a hyperonym of *verdir* with respect to the result state *s* because all the properties of *s* which can be inferred from *colorer* can also be inferred from *verdir* with respect to its result state  $s'$ . It follows from *colorer* that the colored object has a different color than before. The same follows from *verdir* with respect to  $s'$ , but *verdir* also implies that the new color of the object is green.

It should be noticed that *colorer* can actually not be conceived of as a hyperonym of *verdir* with respect to the whole event. While *colorer* is typically used with animate subject referents, *verdir* allows uses with non-animate subject referents in which *verdir* can not always be replaced by *colorer*. Thus, only the relativized notion of hyperonymy/hyponymy allows us to capture the particular relationship between verbs like *colorer* 'color', *teindre* 'dye', and *peindre* 'paint' on the one hand and *verdir* 'make green', *bleuir* 'make blue', *jaunir* 'make yellow' on the other which only holds with respect to the result state.

3.1.5. *Inference behavior*

If two sentences just differ with respect to a certain grammatical category or are related by a certain kind of diathesis (e. g. progressive vs. non-progressive or active vs. stative passive), these sentences also differ systematically with respect to certain inferences. But often there is in addition a lexical property that interferes with this systematic inferential pattern (cf. Engelberg 2000a: 54ff). This is, for example, the case with the relation between causative and inchoative variants of verbs. It has often been observed that a sentence containing the causative variant of a verb systematically entails the corresponding sentence with the inchoative verb variant (11). Interestingly, the entailment relation between the causative and the inchoative variant does not always hold if the verbs are put in the progressive form (12). It doesn't hold for (12b) because Rebecca might have been interrupted while felling the tree, in which case the tree might never have been falling.

- (11) a. Rebecca dried her hair.                   → Her hair dried.  
       b. Rebecca felled the tree.               → The tree fell.

- (12) a. Rebecca was drying her hair.       → Her hair was drying.  
       b. ¬[Rebecca was felling the tree.   → The tree was falling.]

The different inference behavior in (12) is due to semantic peculiarities of the verb *dry* on the one hand and *fell* on the other. With *dry* the temporal relation between the causing event (Rebecca acting upon her hair) and the caused event (her hair drying) can be conceived of as temporally parallel or overlapping as with *abtrocknen* 'dry off' in Lex 1 (section 2.2). This temporal relation does not hold with *fell*; the causing event (Rebecca acting upon the tree) precedes the caused event (the tree falling). This peculiarity of *fell* is captured in Lex 12.

<i>fell</i>	SEM: $\lambda y \lambda x \lambda e [\text{FELL}(x, y, e)]$
LES:	$(\rightarrow_1 e^{1[+DUR]}; x^{\text{AGENT}}, y^{\text{PATIENT}})$ $< (\rightarrow_1 e^{2[+PCT]}; y^{\text{PATIENT}}) < (\rightarrow_1 s; y^{\text{PATIENT}})$

Lex 12. Lexical entry for English transitive *fell*.

### 3.2. Lexical Event Structures and linking

#### 3.2.1. General assumptions about valency and linking

Lexical Event Structures were developed in a project that was mainly concerned with the syntactic and semantic valency of words. A number of basic assumptions have guided the work in our project, which I will briefly present here in order to enhance the understanding of the linking approach to be presented in the remainder of this section.

At the core of the project lies the 'Multidimensional Theory of Valency' which distinguishes four core dimensions of valency.<sup>11</sup>

- (i) *Form specificity*: A phrase is form-specific for a predicate P if it realizes a syntactic feature (in particular a case or a selected preposition) required by P.
- (ii) *Obligatoriness*: A phrase is obligatory for P, if P requires its realization.
- (iii) *Argumenthood*: A phrase is an argument of a predicate P if it specifies an open variable in the meaning representation of P.
- (iv) *Content specificity* (selectional restrictions): A phrase is content-specific for a predicate P if it has a semantic feature that is required by P.

The first two constitute the syntactic valency of a word and the last two the semantic valency. The notation employed to describe these valency dimensions is exemplified in the lexical entry Lex 13. The verb *aufwecken* 'wake up' has two variables for argument positions *x* and *y*, and the expression which specifies *y* is content-specific in the sense that it has to refer to an animate being. Both arguments are obligatory – otherwise there would be a second lexical entry representing the intransitive */nom* variant – and have to be realized as accusative and nominative NPs, respectively. For details, e. g. why these cases are not considered to be structural cases and why optionality requires a second lexical entry, cf. Jacobs (1993, 2003), Engelberg (2000a: 116ff, 2002a).

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<sup>11</sup> The theory goes back to Jacobs (1994a, 1992a, 2003) and is worked out in several books and articles, the most notable being Jacobs (1992b) on the processing of syntactic valencies, Jacobs (1993, 1994b), Blume (1993) and Engelberg (2002a) on implicit arguments, as well as the work discussed in the course of this section. Besides the four core dimensions other valency dimensions have also been employed, among others 'participation' (whether a referent of a phrase participates in the event denoted by the verb).

<i>aufwecken</i>	SYN: /acc/nom
	SEM: $\lambda y^{[+ANIMATE]}\lambda x\lambda e[AUFWECK(x,y,e)]$

*Lex 13.* Lexical entry for the two-place German verb *aufwecken*, 'wake up'.

The valency dimensions are independent of each other. No two of them necessarily occur together, e. g. a phrase can be form-specific without being obligatory (13a,b) or obligatory without being form-specific (13c,d), etc.

- (13) a. Das half ihm / \*ihn.  
           'That helped him.DAT / him.ACC.'  
       b. Das half.  
           'That helped.'  
       c. \*Er wohnte.  
           'He lived (resided).'  
       d. Er wohnte dort / luxuriös / in Wuppertal.  
           'He lived (resided) there / luxuriously / in Wuppertal.'

Linking is understood as the coindexation of the lambda-prefixed semantic argument variable of a predicate with positions in the syntactic valency description of the predicate, and is thus explicitly specified in the lexicon as in *Lex 14*. In the following I will omit these indices and present syntactic and semantic valency in aligned order, where the first position in the semantic valency corresponds to the first position in the syntactic valency and so on.

<i>verschlingen</i>	SYN: /acc <sup>2</sup> /nom <sup>1</sup>
	SEM: $\lambda y^2\lambda x^1\lambda e[VERSCHLING(x,y,e)]$

*Lex 14.* Lexical entry for German *verschlingen*, 'devour'.

Linking rules are understood as restrictions for co-indexations of the described sort. They do not predict unambiguously which arguments relate to which syntactic cases. What they do tell us is which syntactic valencies are universally possible for a verb with a particular meaning, that is to say, they predict with respect to the syntactic and semantic valency information which lexical entries can occur in human languages. E.g., for a verb bearing the meaning  $\lambda y\lambda x\lambda e[FOLLOW(x,y,e)]$  the theory will predict that lexical entries

linking *y* either to dative or to accusative case are possible, while for a verb meaning  $\lambda y\lambda x\lambda e[\text{DEVOUR}(x,y,e)]$  a lexical entry linking *y* to dative case will be universally ruled out.

### 3.2.2. *Linking and marked valencies*

In the linking approach pursued by us and worked out in Blume (1998, 2000), it is assumed that some valencies are more marked than others. In an unmarked valency (i) each semantic argument position is linked to a different syntactic case and (ii) each case in the universal case hierarchy in (14) is only included in the syntactic valency description if every higher ranked case is also included (Blume 1998, 2000: 148ff, based on Primus 1994).

- (14) nominative/absolutive > accusative/ergative > dative > genitive > other cases

The degree of markedness of the syntactic valency increases with the number of these conditions that are violated. Thus, */nom/acc* and */erg/abs* are unmarked, */nom/dat* and */abs/dat* are slightly marked, */erg/dat* is more marked (since both case specifications violate condition (ii) and */gen/gen* is extremely marked (and probably not attested in natural languages) (Blume 2000: 221). The more marked a valency is, the more rarely it is found in natural languages, e. g. */abs/dat* valencies are much more frequent than */erg/dat* valencies.

Starting from these assumptions, Blume (2000), investigating 11 languages from the Indo-European, Finno-Ugric and Austronesian language families, answers two questions: (i) How are marked syntactic valencies licensed? (ii) How are the arguments of marked and unmarked valencies linked to their respective cases?

As far as the first question goes, the data suggest that crosslinguistically unmarked valency patterns can be found with verbs of any semantic class, whereas marked valencies can be found only with verbs that fulfill certain semantic conditions. At first sight, though, the group of verbs showing up with marked valencies seems rather heterogeneous. Looking only at German verbs with the marked */nom/dat* valency, at least five groups emerge and are dealt with in Blume (2000): verbs of interaction, psych- and perception verbs, unaccusative verbs, verbs of possession, and certain kinds of stative verbs. Despite this heterogeneity, what Blume (2000: 180ff) identifies as the licensing condition for marked syntactic valencies of two-place

verbs is limited semantic transitivity. That is to say, neither verbs that are transitive to a high degree, nor verbs with a particularly low degree of transitivity allow marked syntactic valencies. The notion of transitivity as well as the linking principle are based on a prototype approach to thematic roles in the vein of Dowty (1991). As we have seen in section 2.2, semantic relations connect subevents and event participants. In Blume's (2000: 169f) approach, one set of these entailed relations characterizes a prototypical agent and another set a prototypical patient. The proto-agent properties are (i) CONTROL of the subevent, (ii) SENTIENCE with respect to the subevent, (iii) pursuing a particular interest or INTENTION with respect to a subevent, and (iv) exhibiting ACTIVITY or a particular function. Among these entailments ACTIVITY and the combination of CONTROL and INTENTION are considered to be particularly "potent" proto-agent properties. The proto-patient properties are (i) being CONTROLLED by another participant in a subevent, and (ii) being AFFECTED by the physical or mental impact of another participant. Participants which do not entail any proto-agent or proto-patient entailments with respect to a subevent are marked as THEMATIC.

Blume's concept of semantic transitivity is characterized by four properties (Blume 2000: 186). A verb is semantically transitive if (i) it has at least two distinct argument positions, (ii) at least one argument is a participant in the event, (iii) at least one argument has potent proto-role properties, and (iv) there is a clear asymmetry between the two arguments with respect to the distribution of proto-role properties. The more of these criteria apply, the more transitive the verb is. A verb is said to be of limited transitivity if the first three of these conditions are fulfilled but not the last one, i. e. there is no clear asymmetry in the distribution of proto-roles. This kind of limited semantic transitivity is what licenses marked syntactic valencies.

A few examples will show how this condition cuts the right piece out of the verbal lexicon. Verbs like *essen* 'eat' fulfill all the transitivity conditions in having two arguments standing for event participants with potent proto-role properties and a clear asymmetry between proto-agent properties for the subject and proto-patient properties for the object. A verb like *sich verspäten* 'be late' as a syntactically two-place verb with an expletive reflexive violates condition (i), a verb like *kosten* 'cost' where both arguments do not realize event participants violates condition (ii), and a verb like *besitzen* 'own' violates condition (iii) in not exhibiting any proto-role properties for one of its arguments. All of these verbs typically have unmarked valencies; in German they are /nom/acc-verbs. In the case of verbs like *essen*, this is due to high transitivity, in the other cases due to low transitivity.

Three /nom/dat verbs will serve here to illustrate the case of limited transitivity, the perception verb *schmecken* 'taste (good)', the interaction verb *folgen* 'follow' and the two-place unaccusative *zerbrechen* 'break' (cf. also Blume 2000: 191ff):

- (15) a. Die Suppe schmeckte ihm.  
the soup.NOM tasted (good) he.DAT  
'The soup tasted good to him.'
- b. Sie folgte dem Mann.  
she.NOM followed the man.DAT  
'She followed the man.'
- c. Die Vase zerbrach ihm.  
the vase.NOM broke he.DAT  
'The vase (went and) broke on him. /  
He inadvertently caused the vase to break.'

The verb *schmecken*, which is event-structurally simple and has two event participants, implies SENTIENCE for the person doing the tasting, but exhibits no other proto-role properties. Thus, there is only a weak asymmetry of proto-role properties indicating limited transitivity (Lex 15).<sup>12</sup>

<i>schmecken</i>	SYN: /nom/dat
	SEM: $\lambda y \lambda x \lambda e [\text{SCHMECK}(x, y, e)]$
	LES: $(\rightarrow_1 e^{1[+DUR]}; x^{\text{SENTIENCE}}, y^{\text{THEMATIC}})$

*Lex 15.* Lexical entry for German *schmecken* 'taste (good)'.

Verbs of interaction like *folgen* 'follow', *antworten* 'answer', *nachgeben* 'give in', *trotzen* 'defy', etc. are characterized by a presupposed subevent, in which one of the two participants acts (moves away, asks something, exerts pressure, etc.) and a second overlapping implied subevent in which the other participant acts. The distribution of proto-role properties is obviously not asymmetric while all the other transitivity conditions are fulfilled. Thus, the marked valency is licensed.

<sup>12</sup> The Lexical Event Structures of the verbs illustrated here slightly deviate from the structures given in Blume (2000). This does not affect her argumentation, though.

<i>folgen</i>	SYN: /dat/nom
	SEM: $\lambda y \lambda x \lambda e [\text{FOLG}(x, y, e)]$
	LES: $(\rightarrow_P e^1[+\text{DUR}]; y^{\text{ACTIVITY}/\dots}) \circ (\rightarrow_I e^2[+\text{DUR}]; x^{\text{ACTIVITY}/\dots})$

*Lex 16.* Lexical entry for German *folgen* 'follow'.

Finally, the unaccusative two-place *zerbrechen* 'break' (and similarly for verbs like *verrotten* 'rot' or *überkochen* 'boil over') expresses that some object *x* breaks as a consequence of some presupposed event the other participant *y* was involved in and that the breaking of *x* is to the disadvantage of *y*. Since *y* neither intends nor controls the breaking of *x* and *x* exhibits none of the two proto-patient properties, there is only a slight asymmetry in proto-role properties, such that the marked valency is licensed.

<i>zerbrechen</i>	SYN: /nom/dat
	SEM: $\lambda y \lambda x \lambda e [\text{ZERBRECH}(x, y, e)]$
	LES: $(\rightarrow_P e^1; x^{\text{ACTIVITY}}, y^{\text{THEMATIC}})$ $< (\rightarrow_I e^2[+\text{PCT}]; y^{\text{THEMATIC}}) < (\rightarrow_I s; y^{\text{THEMATIC}})$

*Lex 17.* Lexical entry for the two-place variant of German *zerbrechen* 'break'.

The licensing condition for marked valencies explains which verbs can occur with /nom/dat and other unmarked valency patterns. What it doesn't tell us, though, is which argument in the semantic valency description has to be linked to which case in the syntactic valency description. This is accomplished by a two-part universal linking principle.

#### (16) *Universal Linking Principle*

- (A) For unmarked valencies: (i) The argument which exhibits potent proto-agent properties in the first implied subevent will become nominative or ergative. (ii) The argument which has the most proto-patient properties and the least proto-agent properties will become accusative or absolutive.
- (B) For marked valencies: The argument which exhibits potent proto-agent properties in the first implied subevent will receive the highest ranked case in its syntactic valency.



The linking principle for unmarked valencies not only predicts the distribution of cases for two-place verbs but also for three-place verbs, e. g. for those denoting 'giving' events (Lex 18, ex. 17a). The giver in Basque *eman* 'give' appears in ergative case since it has potent proto-agent properties in the initial subevent, the given object occurs as an absolutive NP since it has the least proto-agent properties, while the recipient, which has agentive properties in the second 'receiving' subevent, gets the dative as the remaining case of the syntactic valency of the verb.

<i>eman</i>	SYN: /abs/dat/erg
	SEM: $\lambda z\lambda y\lambda x\lambda e[EMAN(x,y,z,e)]$
	LES: $(\rightarrow_P e^1: x^{ACTIVITY/CONTROL}, y^{AFFECTED}, z^{AFFECTED})$ $< (\rightarrow_I e^2: y^{ACTIVITY/CONTROL}, z^{AFFECTED})$ $< (\rightarrow_I s: y^{THEMATIC}, z^{THEMATIC})$

Lex 18. Lexical entry for Basque *eman* 'give'.

- (17) a. Zuek            lagunei            opari    poliak            ematen  
 You.PL:ERG friend.PL:DAT present nice.PL:ABS give.IMPF  
 dizkiezue.  
 3:ABS.have.DAT.PL:ABS.3:PL:DAT.2:PL:ERG  
 'You always give nice presents to your friends.'  
 (Joppen & Wunderlich 1995: 129)
- b. Oku    ou    muimui 'i            he    ka.<sup>13</sup>  
 PROG I.ABS follow    DAT(OBL) DET car  
 'I am following the car.'  
 (Chung 1978: 54)

For verbs with marked valencies, Blume's linking principle correctly predicts that interaction verbs like German *folgen* 'follow' (Lex 16), Tongan *muimui* 'follow' (Lex 19, ex. 17b) or Hungarian *felel* 'answer' (Lex 20, where it is presupposed that *y* asks *x* something), whose distribution of proto-role properties is often completely symmetric, link the proto-agent in the implied subevent to the highest ranked case in the syntactic valency, which is absolutive for *muimui* and nominative for *felel* (cf. also Blume 1998).

<sup>13</sup> I follow Blume (2000: 204) here in naming the subject case with intransitive verbs in Basque 'absolutive' ('nominative' in other sources) and the non-ergative, non-absolutive case in Tongan 'dative' ('oblique' in other sources).

<i>muimui</i>	SYN: /dat/abs
	SEM: $\lambda y \lambda x \lambda e [\text{MUIMUI}(x, y, e)]$
	LES: $(\rightarrow_p e^1 [+DUR]; y^{\text{ACTIVITY/CONTROL}} \dots)$
	$<_o (\rightarrow_i e^2 [+DUR]; x^{\text{ACTIVITY/CONTROL}} \dots)$

*Lex 19.* Lexical entry for Tongan *muimui* ‘follow’.

<i>felel</i>	SYN: /dat/nom
	SEM: $\lambda y \lambda x \lambda e [\text{FELEL}(x, y, e)]$
	LES: $(\rightarrow_p e^1; y^{\text{ACTIVITY/CONTROL}}, x^{\text{THEMATIC}})$
	$< (\rightarrow_i e^2; x^{\text{ACTIVITY/CONTROL}}, y^{\text{THEMATIC}})$

*Lex 20.* Lexical entry for Hungarian *felel* ‘answer’.

Verbs of uncontrolled perception like *schmecken* ‘taste (good)’ (Lex 15) as well as stative psych-verbs do not exhibit potent proto-role properties. Since these verbs license marked valencies and the distribution of proto-role properties does not force one of the arguments to occur in a particular case, marked and unmarked valencies with the stimulus or the experiencer in nominative or ergative (for unmarked valencies) or the highest available case (for marked valencies) are to be expected. This is borne out by the fact that in many languages these verbs come in pairs with converse case assignments (e. g. German *mögen* ‘like’, /nom/acc, vs. *gefallen* ‘please’ /dat/nom).

Languages differ as to how widely they use the options provided by the licensing conditions for unmarked valencies. According to Blume (2000: 200), in languages like Czech and Finnish, verbs of limited semantic transitivity often occur with marked valencies, while Romanian prefers unmarked valencies.

It should be noted that Blume’s approach avoids the conceptual problems emerging from theories which assume that cases are either completely predictable from argument structure (structural cases) or are completely idiosyncratic (lexical cases), as is often assumed for the dative with two-place verbs. In contrast, Blume’s theory just restricts the possible valency frames for verbs with a given meaning, correctly predicting that certain verbs can assume a /nom/dat pattern in one language and a /nom/acc pattern in another, yet still accounting for the non-arbitrariness of the /nom/dat (or any other marked) valency option.<sup>14</sup>

<sup>14</sup> Cf. Blume’s (2000: 91ff) discussion of approaches to the dative in generative syntax and Lexical Decomposition Grammar.



- (19) a. Mig      brestur kjark.                    / Mër      brestur kjarkur.  
           me.ACC lacks    courage.ACC / me.DAT lacks courage.NOM  
           'I lack courage.'
- b. Mig      vantar hníf.                    / Mër      vantar hníf.  
           me.ACC lacks    knife.ACC / me.DAT lacks    knife.ACC  
           'I lack a knife.'
- (Smith 1994: 683)

Thus, Lexical Event Structures have proven essential for the explanation of the occurrence of marked valency patterns and for the rules linking arguments to syntactic cases in the lexical specification of verbs. In particular, the structuring of an event into subevents, the semantic relations between participants and subevents, and the distinction between implied and pre-supposed subevents have played an important role here.

#### 4. Cognitive foundation of the predicates and sortal distinctions of the semantic metalanguage

##### 4.1. The granularity of events

###### 4.1.1. Coarse-grained and fine-grained events

In event semantics, the notion of 'event' pertains to one of the basic ontological sorts besides e. g. individuals and propositions. Opinions differ as to whether the introduction of events as a basic ontological sort is sufficiently justified by its semantic necessity or whether a clear account of what it means to be an event has to be given. I have argued elsewhere (Engelberg 2000a: 215ff, 2001) that an exploration into the nature of events independently of their semantic usefulness enhances the empirical soundness of the semantic theory considerably. Following a long tradition in analytic philosophy, I assume that the nature of a basic ontological sort of entities can best be revealed by establishing a criterion of identity for this sort. Such a criterion states the conditions under which two variables  $e^1$  and  $e^2$  stand for the same entity. It thereby follows Quine's (1982: 102) principle 'no entity without identity' which encompasses the idea that the concept of entity as something that can be quantified over has to come with a clear idea of how an entity of a given sort can be distinguished from another entity of this sort or, in other words, whether  $e^1$  and  $e^2$  count as 2 or as 1.<sup>15</sup>

<sup>15</sup> Detailed event ontological discussions can be found in Bennett (1988), Stoecker (1992), Engelberg (2000a), and Eckardt (2002).

Identity criteria for events have been established between two poles. On the one hand, events have been conceived of as concrete thing-like individuals (e.g. by Quine 1976 and Lemmon 1967). In this case an event  $e^1$  (described in a particular way) and an event  $e^2$  (described in a particular way) are identical if  $e^1$  takes place at the same time and at the same place as  $e^2$ . This is a coarse-grained conception of events, since many events that are distinguished under other conceptions of events are lumped together. E. g., if there is an event  $e^1$  described as a rotating of a metal ball from 4 to 5 o'clock and an event  $e^2$  described as a heating up of the same metal ball from 4 to 5 o'clock,  $e^1$  and  $e^2$  are identical under this event conception.

On the other hand, there are identity criteria which take events to be more abstract entities (cf. e.g. Kim 1976). They either don't clearly distinguish between events and propositions or conceive of events as having at least a strong propositional flavor. In this case, an identity criterion could require that  $e^1$  and  $e^2$  are identical if the same individuals are involved in  $e^1$  and  $e^2$  and the same event properties are predicated over  $e^1$  and  $e^2$ . This is a fine-grained conception of events that yields more events than a coarse-grained one. E. g., if there is an event  $e^1$  described as the rotating of a metal ball from 4 to 5 o'clock and an event  $e^2$  described as the fast rotating of the same metal ball from 4 to 5 o'clock, then  $e^1$  and  $e^2$  are different events because 'rotating' and 'fast rotating' are different event properties. Events wouldn't be distinguished, though, by different descriptions of the involved objects:  $e^1$  as the rotating of a metal ball  $x$  from 4 to 5 o'clock and  $e^2$  as the rotating of the red metal ball  $x$  from 4 to 5 o'clock would still be identical.

In Engelberg (2000a) I have argued in length that neither overly coarse-grained event conceptions nor overly fine-grained ones are adequate from either a cognitive or a semantic point of view. A plausible event conception that allows the explanation of a wide range of semantic phenomena should take into consideration that the events we talk about in natural languages are events in the world as we conceptualize it. Having this in mind, events can be located more on the concrete side of the spectrum of different event conceptions. On this view, they are entities located in time and space, yet a temporal-spatial slot can in principle be occupied by more than one event under certain restrictions. More precisely, a particular time-space slot can host as many events as there are cognitive mechanisms to individuate events in this slot. The existence of these event individuating mechanisms is an empirical matter of cognitive science. Movement events shall serve in the following to illustrate this.

#### 4.1.2. *The perception of events*

If an individual moves by rolling, walking, swimming, etc. the time-space slot of this event is defined by the duration of the movement and the local position of the individual during the several stages of the movement. These movements involve two components, a change of place from A to B, which I will call a translatory movement, and a particular fashion which characterizes this translatory movement and which distinguishes the running from A to B from the walking from A to B. We might ask now whether we conceptualize Jamaal's walking from A to B as a single translatory movement  $e^1$  of the walking-type or of a translatory movement of Jamaal's body from A to B ( $e^1$ ) plus a simultaneous movement of his body parts, namely those movements which characterize walking ( $e^2$ ) and which I will call relative movements. Since in the latter case  $e^1$  and  $e^2$  would occupy the same temporal-spatial slot, our conception of events would force us to say that there are two different cognitive mechanisms, one that singles out translatory movements and one that singles out relative movements of different types.

Which options our cognitive apparatus makes use of can be discovered by exploring how we perceive the rolling of a wheel. If a wheel rolls along a street there are at least two ways in which we can conceive of this movement: (i) Each minimal part of the wheel describes a so called cycloid movement as depicted in Figure 1. The rolling along of the wheel is the sum of all the cycloid movements of its parts. In order to see a wheel rolling along, we would then need a cognitive mechanism that computes cycloid transformations.

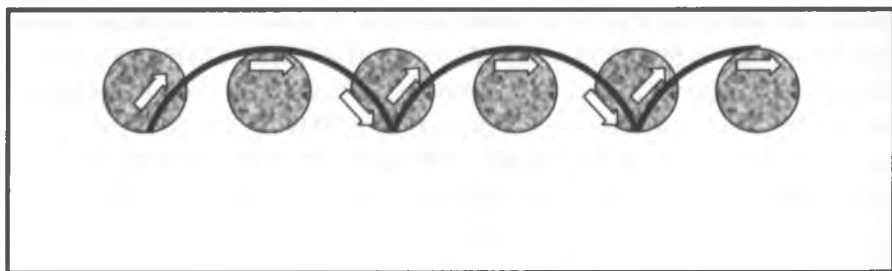
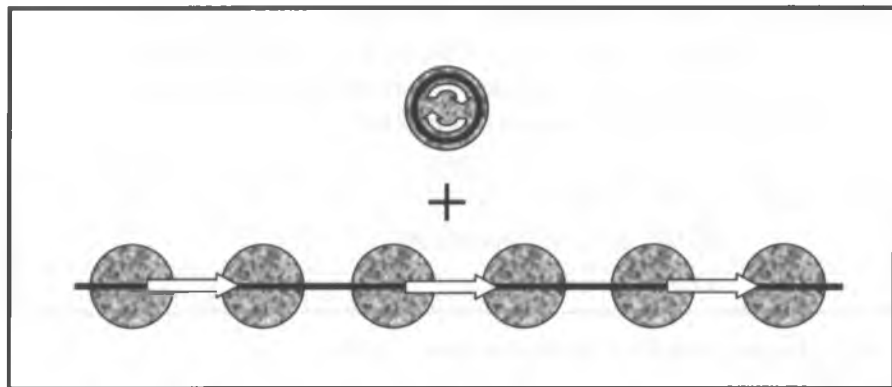


Figure 1. Description of a rolling wheel as consisting of cycloid movements.

(ii) Each part of the wheel describes a translatory movement relative to its background and at the same time each part of the wheel describes a rotational movement relative to the center of the wheel as depicted in figure 2.

The rolling along of the wheel is the sum of all translatory movements of its parts plus the sum of all rotational movements of its parts. In order to see a wheel rolling along, we would then need two cognitive mechanisms, one that computes translatory transformations and one that computes rotational transformations.



*Figure 2.* Description of a rolling wheel as consisting of translatory and rotational movements.

Psychological experiments carried out by Duncker (1929) and which have been given a formal treatment in Shaw, Flascher & Mace (1994) clearly show that human observers opt for the second mode of perception. We do indeed see two different movements of the same object at the same time, a translatory movement of the wheel ( $e^1$ ) relative to its surrounding and a rotation movement ( $e^2$ ) relative to the center of the wheel. This complements other research on event perception, in particular Johansson's work on the perception of 'biological' movements, i. e. the movements of living beings. Johansson's experiments clearly establish that movements are always perceived relative to particular reference frames which can themselves move. Particularly in the case of biological movements, we perceive a translatory movement of the whole body relative to its surrounding and independently of that, relative to the moving body, the particular 'walking', 'dancing' or 'running' movements (cf. Johansson 1975, 1978).

In sum, for movement events we perceive two events which fill the same time-space slot, a translatory movement event and a relative movement event, for each of them there exists a particular, cognitively implemented mode of computation that allows the individuation of two events in the same temporal-spatial slot.

4.1.3. *Two-movement verbs*

This cognitive approach to movement events is corroborated by linguistic data. The level of granularity we have assumed to characterize events can be shown to be linguistically relevant. In contrast to approaches which assume movement verbs to be represented as consisting of an event-like component plus a manner component (e. g. Talmy 1975; Snell-Hornby 1983; Levin & Rappaport Hovav 1992), I adopt a two-event analysis of movement verbs.<sup>16</sup> The event a verb like *roll*, *swim*, *walk*, or *run* refers to consists of two temporal subevents as in Lex 21.

<i>schwimmen</i>	SYN:	/nom
	SEM:	$\lambda x \lambda e [\text{SCHWIMM}(x, e)]$
	LES:	$(\rightarrow_1 e^1 [+DUR]; x^{\text{AGENT}}) \circ (\rightarrow_1 e^2 [+DUR]; x^{\text{AGENT}})$

Lex 21. Lexical entry for German *schwimmen* 'swim'.<sup>17</sup>

Three phenomena provide support for this approach. Firstly, if the two components of movement verbs can be lexicalized separately, they are usually both lexicalized as verbs:

- (20) a. The wheel went / moved down the hill.  
 b. The wheel rotated (<sup>??</sup>down the hill).

If we think of verbs as the main means to classify events, the existence of verbs like *go* or *move* versus *rotate* indicates that we indeed distinguish the two components of *roll* as different events and not just as an event and a manner, in which case we would expect the second component to be lexicalized as an adverb.

Secondly, in cases where a verb refers to a translocatory movement only, and the specific relative movement is characterized by an additional lexical item, this item is usually a verb and not an adverb. In the Korean example in (21a) the relative movement is expressed by a verb that becomes part of a verb complex, in the Spanish example in (21b), the relative movement is expressed by a gerund:

<sup>16</sup> Kaufmann (1995: 232) and Paris (2003) make similar assumptions.

<sup>17</sup> The fully specified representation of *schwimmen* would of course include information about the type of movements that the two subevents characterize.



- (21) a. John-i pang-ey ttwui-e tul-e o-ass-ta.  
 John-SUBJ room-LOC run-CONN enter-CONN come-PAST-DECL  
 'John came in(to) the room running.'  
 (Choi & Bowerman 1991: 88)<sup>18</sup>
- b. El jefe entró a su oficina corriendo.  
 the boss entered to his office running  
 'The boss ran into his office.'  
 (Paris 2003)

Thirdly, if adverbials are often clearly related to one of the subevents, as we have shown in section 3.1.2, and verbs of movement denote an event consisting of two simultaneous subevents, then we should find that adverbials behave similarly in this domain. Indeed, adverbials like *direkt* 'directly, straight' and *elegant* 'elegantly' as in (22) are obviously related to different subevents, *direkt* modifying the translatory movement and *elegant* the relative movement (cf. Engelberg 2000a: 297).

- (22) a. Sie schwamm elegant zum gegenüberliegenden Beckenrand.  
 she swam elegantly to the opposite pool edge  
 'She performed a translatory movement accompanied by an elegant relative (swimming) movement to the opposite pool edge.'
- b. Sie schwamm direkt zum gegenüberliegenden Beckenrand.  
 she swam straight to the opposite pool edge  
 'She performed a straight translatory movement accompanied by a relative (swimming) movement to the opposite pool edge.'

## 4.2. Events and "free will"

### 4.2.1. Volition and the licensing of the intransitive verb passive

Agentivity is one of the lexical-semantic notions that is notoriously difficult to define. It has been suggested that the agent is the one who "wills the action and intentionally effects it" (Gruber 1976: 157), whose "action is volitional", who "is in control of what he does" and "is primarily responsible for what happens" (Lakoff 1977: 244), who is "doing or causing something, possibly intentionally" (Andrews 1985: 68) and who is the "instigator of some action" (Radford 1988: 373). Definitions of this sort of course pre-

<sup>18</sup> SUBJ = subject marker, LOC = locative marker, CONN = connecting suffix, PAST = past tense marker, DECL = declarative ending.

suppose that the terms used to define the concept of agentivity – ‘will’, ‘intention’, ‘volition’, ‘control’, ‘responsibility’, ‘causation’, ‘instigation’ – are better understood than the term to be defined. However, I’m doubtful whether this is the case. In the following I want to have a critical look at the concept of ‘volition’ and its usefulness for lexical semantics.

Among the phenomena which have been tied to volition and similar agentivity-related concepts is the intransitive verb passive, sometimes also called ‘impersonal passive’, which is quite common in a number of Germanic languages, e. g. German (23a), Dutch (23b), Swedish (23c), or Icelandic (23d). An intransitive verb passive can be defined as a passive construction where no subject (*/nom*) occurs which would correspond to a direct object (*/acc*) of the respective active sentence.<sup>19</sup>

- (23) a. Es wurde \_\_\_\_\_ gerannt [...].  
it AUX-PAS-PAST-3SG run-PART  
'There was running going on [...].' (COSMAS corpus)<sup>20</sup>
- b. Er wird \_\_\_\_\_ getelefoneerd.  
it AUX-PAS-PAST-3SG telephone-PART  
'There was phoning going on.' (Zaenen 1993: 133)
- c. Det skjuts \_\_\_\_\_ ute.  
it shoot-PAS-PRES outside  
'There is shooting going on outside.' (Oksaar 1972: 95)
- d. Það var \_\_\_\_\_ synt.  
it AUX-PAS-PAST-3SG swim-PART-NEUTR-SG  
'There was swimming going on.' (Yamaguchi 2002: 267)

The use of the intransitive verb passive is restricted, though. Many intransitive verbs do not allow this construction:

<sup>19</sup> The conditions under which the expletive appears in Germanic languages are different (Siewierska 1984: 108ff). In German, the expletive may not occur if any other constituent occupies the "Vorfeld", the position in front of the finite verb in main clauses (for a discussion cf. e. g. Fagan 1992: 177ff):

(i) Es wurde gestern viel getanzt.  
it AUX-PAS-PAST-3SG yesterday a lot dance-PART  
'There was a lot of dancing going on yesterday.'

(ii) Gestern wurde (\*es) viel getanzt.

<sup>20</sup> Most of the German examples in this section are taken from corpora available online such as the DWDS corpus (<http://www.dwds Corpus.de/>) and the COSMAS corpora (<http://www.ids-mannheim.de/cosmas2/>).

- (24) a. \*Es wurde                               erstickt.  
it AUX-PAS-PAST-3SG suffocate-PART  
'There was suffocating going on.'  
b. \*Es wurde                               gestunken.  
it AUX-PAS-PAST-3SG stink-PART  
'There was stinking going on.'

The licensing condition has most often been formulated in terms within the domain of agentivity. Wilmanns (1906: 302f.) claims that the intransitive verb passive presupposes “wirkende Personen” (‘effectively acting individuals’), Curme (1970: 338) assumes that the intransitive verb passive can only be used with verbs “which express an activity or condition that stands in a relation to a free moral agent.” In particular, the notion of ‘volition’ has been brought into play (Perlmutter 1978: 162<sup>21</sup>, Moorcroft 1985: 160, Fagan 1992: 124, Zaenen 1993: 147), i. e. it is assumed “that the one participant in the event described by the impersonal passive clause is volitional and that volitionality is a relevant factor in the formation of the impersonal passive” (Arnett 1997: 399). Although the concept of ‘will / volition’ has been extensively discussed in philosophy and the neuro-cognitive sciences, most linguistic work contents itself with an intuitive concept of volition. Sometimes volition is equated with or vaguely paraphrased by other concepts which tend to remain equally mysterious, though. For example, Arnett (1997) sometimes changes between ‘volition’ and ‘control’ as licensing property, while Zaenen (1993: 133, 147) starts out with controllability of the event as the crucial factor, and then relates this property to that of ‘volitionality’ as it is used as a proto-agent property in Dowty (1991). Dowty (1991), in turn, in discussing volitionality also brings the concept of ‘intentionality’ into play. Zaenen (1993: 133) furthermore points out that the concept of control can be understood in the sense of the predicate DO in Ross (1972) where every activity verb is syntactically embedded under DO (Ross 1972: 70, 93). Ross himself, although he introduces DO as “a higher predicate of intentionality” (Ross 1972: 105, 116), emphasizes that DO differs from Fillmore’s (1968) concept of agentivity since it is also used for the derivation of sentences reporting non-volitional events like *what the rolling boulders did is crush my petunias to smithereens* (Ross 1972: 106).

<sup>21</sup> Perlmutter (1978: 162) states that besides predicates describing “willed and volitional acts” also those describing “involuntary bodily processes” like sneezing, belching, sleeping are expressed by unergative verbs and therefore allow intransitive verb passives.

Thus we end up with a hodgepodge of words referring to some unclear concept in the domain of volition, control, intention, and agentivity. In the following I want to defend two claims: (i) 'volition / will' is not an adequate concept to characterize the licensing conditions for the intransitive verb passive. (ii) Claim (i) or the opposite of it can only be upheld if we have a sufficiently clear idea of what 'volition / will' is.

The assumption that volition is crucial for licensing the intransitive verb passive in German can come in two variants. Variant A: the verb occurring in the intransitive verb passive lexically entails that the event denoted is brought about volitionally by one of its participants. Variant B: in order for a verb to appear in the intransitive verb passive, it has at least to be inferable from the context that the event is brought about volitionally by one of the participants. Variant A is obviously wrong. Verbs like *husten* ‘cough’, *rülpfen* ‘belch’, *schlafen* ‘sleep’, *atmen* ‘breathe’, or *gähnen* ‘yawn’ (25) – even if I can cough, breathe or yawn volitionally – do not entail volition on part of the participant.

- (25) a. In den Pressekonferenzen wird jetzt ständig gähnt.  
'At press conferences there is now constant yawning going on.'  
(DWDS corpus)
- b. Da wird oft durch den Mund geatmet.  
There AUX often through the mouth breathe-PART  
'Breaths are often taken through the mouth there.'  
(COSMAS corpus)

Zaenen (1993: 134, 147), who also observes this problem, wants to save 'volition' as a lexically determined licensing property by claiming that the verb merely has to have a "volitional dimension". While it seems at first sight that this weakening of the volition thesis affects only a handful of verbs which denote bodily reactions, a closer look reveals that volitionality is only very rarely lexically entailed at all. Even actions like drawing, scribbling, tapping or walking are not necessarily carried out volitionally as we know from unconscious drawing or scribbling during phone calls, from unknowingly tapping on the table while thinking about the next sentence to write, or from somnambulists walking on the roof ridge. And even if we were very generous and would allow all verbs to occur in the intransitive verb passive which denote events which at least sometimes are carried out volitionally, we are confronted with counter examples like (26a). We can't sweat by the mere force of our will. Of course, we can do something volitionally that will make us sweat but we can also do something that will

make us sink towards the bottom of Lake Erie without this something licensing sentences like (26b).

- (26) a. Auf dem gleichen Sportplatz wird viel geschwitzt.  
 'On the same sports field there is much sweating going on.'  
 (COSMAS corpus)
- b. \*Am Lake Erie wird wieder viel gesunken.  
 'On Lake Erie there is again much sinking going on.'

Variant B of the licensing condition is often discussed with respect to examples like (27a) where it is claimed that verbs like *bluten* 'bleed' or *sterben* 'die' can only occur in the intransitive verb passive because volitionality on part of the participant can be reconstructed from the context (here e. g. from the adverb *willig* 'willingly'). But there are numerous examples where volition is neither entailed by the verb nor inferable from the context nor introduced by the passive construction itself. Sentences like (27b) to (27e) are silent about volitionality if not even suggestive of involuntary events. In particular examples like (27b) show that the small number of unaccusative verbs that occur in the intransitive verb passive do not depend on a contextually driven volitionality interpretation, as has been claimed by Fagan (1992: 124).

- (27) a. Für den lieben König und Herren wird alles getan, wird treulich gekämpft, wird willig geblutet, wird freudig in den Tod gegangen, für ihn wird mehr als gestorben ...  
 'For the dear king and lords all is done, is loyally fought, is willingly bled, is happily gone into death, for him is more than died.'  
 (Curme 1970; transl. by Arnett 1997: 408)
- b. Jetzt wird in 559 Betten gestorben.  
 'Now there is dying going on in 559 beds.' (DWDS corpus)
- c. Widerlich schmeckt plötzlich der Rauch. Rundherum wird verzweifelt gehustet. 'The smoke tastes repulsive suddenly. All around desperate coughing is going on.' (COSMAS corpus)
- d. Da aber niemand seinen zukünftigen Partner schon beim Kennenlernen millimetergenau vermißt, hilft sich die Natur selbst: es wird unbewußt mit Auge und Gehirn gemessen.  
 'However, since nobody measures his partner-to-be by the millimeter during the first meeting nature helps itself: there is unconscious measuring by the eye and the brain.' (COSMAS corpus)
- e. Es wurde unbewusst/gedankenlos auf den Blöcken herumgekritzelt.  
 'There was unconscious/thoughtless scribbling on the notepads.'

#### 4.2.2. *Neural event triggers*

In the following I will try to narrow down the class of events that can be expressed in intransitive verb passive constructions and in the course of the argumentation discuss the concept of 'volition'. I assume that a not too controversial concept of 'doing something volitionally' in the sense of 'exercising one's free will' reflects the following characteristics: (i) Free will is immediately directed towards actions, without any mediating causal links. (ii) Free will involves a choice. (iii) The actor of a volitional action is conscious of his will. (iv) Free will is not immediately determined by external events or stimuli.

If we look at events which are usually described by verbs with human referents in subject position we can distinguish five types according to their different neurocognitive status:

- (i) *Uncontrolled happenings* like falling, stumbling or slipping (usually rendered by unaccusative verbs).
- (ii) *Uncontrolled reflexes* like twitching (with eyelids), kicking (as the result of a strike against the patellar tendon).
- (iii) *Bodily functions* like sweating, digesting, shivering, hiccupping.
- (iv) *Controllable reactions* like yawning, coughing, laughing.
- (v) *Impulse actions* like running, scribbling, dancing, drawing.

Uncontrolled happenings are events that do not require any neurological activity on the side of the individual involved in order to kick off the event. This is different for the other four kinds of events (cf. e.g. Thompson 1985 and Nolte 1999). "A reflex is an involuntary, stereotyped response to a sensory input." (Nolte 1999: 226) The kick which results from a strike against the patellar tendon is a simple and typical example. It just requires a direct connection in the spinal cord between a sensory neuron and a motor neuron (monosynaptic reflex). While not all reflexes are of the monosynaptic type, all reflexes have in common that they do not involve higher neurological components.

Bodily functions are processed by the autonomic nervous system which primarily consists of the sympathetic and parasympathetic systems in the peripheral nervous system. Important nuclei of the autonomic nervous system are located in the brainstem. These areas are influenced by the hypothalamus and parts of the limbic system, which is involved in regulating behaviour that is dependent on emotional and motivational states. Thus, in contrast to what has been said about mere reflexes, the central nervous sys-

tem is involved in regulating bodily functions. However, cortical areas do not contribute to these processes, which therefore remain widely unconscious and are experienced as not dependent on our "free will".

Controllable reactions are events like coughing, crying, belching which are usually reactions to other bodily processes or perceptions and in so far similar to reflexes and bodily functions, but which can to a certain degree be suppressed or initiated by higher neurological impulses.

While reflexes and bodily functions are rather uncontroversial with respect to what we assume to be our "free will" – they are involuntary events – the final group, which I call 'impulse actions' poses some intricate problems if one wants to save the concept of volition for semantic licensing purposes. Neurocognitive experiments starting with Libet (1985) have stimulated the longstanding philosophical discussion of how the will relates to the action it brings about. When we carry out simple everyday actions, the neural activity starts in subcortical areas (cerebellum, basal ganglia) which are connected to the limbic system. From there the premotor cortex and the supplementary motor cortex are activated and finally, a couple of hundred milliseconds before the action sets in, the primary motor cortex shows activity. This poses a challenge to our assumption that free will is a conscious trigger of our actions, since the ultimate impulse for an action comes from a subcortical area which is not accessible to our consciousness. Libet (1985: 530ff) designed an experiment in which the subjects were asked to register the moment in which they made a volitional decision to carry out a simple action like lifting a finger. At the same time their neural activity was being measured. The results showed that the will to carry out the action indeed precedes the activity in the primary motor cortex but follows the activity in the subcortical areas. The experiment suggests that free will is an accompanying feature of certain actions rather than their trigger. This of course does not correspond to our intuition about free will as the ultimate and non-caused trigger of our actions.

These experiments have set off a vivid discussion about the roll of volitionality in human actions. We cannot delve into this here, but two remarks seem to be in order: Firstly, experiments of this sort fit in with the observation above that a lot of our simple daily actions do not necessarily involve the idea of acting volitionally. This pertains to actions like scratching, walking, etc. which do not involve conscious planning as does building a house or writing a dissertation. If I do what I just did – namely scratch my head – then what was characteristic for this action was less that I did it by the force of my free will and more that nothing and nobody else forced me

to scratch my head. Secondly, 'volition/will' is a much shakier concept than it seems at first sight. Thus, its unreflected use as a crucial semantic concept cannot really be recommended. I will therefore prefer to recur to 'impulse actions' as actions which involve neural impulses in subcortical areas as well as in the motor cortex (and which may sometimes be accompanied by an impression of acting volitionally).

One of the reviewers suggested that a classification of events according to the way the neural system is involved in setting off these events cannot be the basis for a speaker's classification of verbal expressions describing these events, since speakers do not have access to knowledge of that sort. However, I think one is justified in assuming that these neural activities are correlated with the way speakers intuitively categorize events they are involved in, since they can judge in how far events originate within them and are not a mere reaction to something happening outside them, as detailed above. In addition, such a (gradual) classification is certainly presupposed for many aspects of human behavior in social contexts. Concepts like 'guilt', 'responsibility', and 'conduct' are hardly conceivable without it.

#### 4.2.3. *Licensing the intransitive verb passive*

Finally, what licenses the intransitive verb passive? Those verbs can occur in the intransitive verb passive which entail that the event denoted by them is due to activity in the central nervous system (within a human or other being exhibiting "higher consciousness") and is carried out without having an immediate external cause, i. e. verbs that denote events of the types (iii) to (v) from the preceding section: bodily functions, controllable reactions, and impulse actions (e. g. Lex 22).<sup>22</sup> While there is a strong feeling that the ultimate triggers for these events are participant-internal, we don't necessarily conceive of them as being carried out volitionally. Furthermore, it seems that the intransitive verb passive is more often found with verbs that denote actions in which higher neural areas are involved, i. e. bodily func-

<sup>22</sup> This, of course, should include more complex events which partly consist of impulse actions, e. g. building or playing:

- (i) Es wird überall in Wuppertal gebaut.  
'There is a lot of building going on everywhere in Wuppertal.'
- (ii) So schlecht wurde im Westfalenstadion schon lange nicht mehr gespielt.  
'There hasn't been such bad playing going on in Westphalia Stadium for a long time.'



tions like digesting and shivering are less commonly expressed in the intransitive verb passive than impulse actions like dancing or gossiping.

<i>kritzeln</i>	SYN: /acc/nom
	SEM: $\lambda y \lambda x \lambda e [KRITZEL(x, y, e)]$
	LES: $(\rightarrow_I e^{1[+DUR]}: x^{IMPULSE/\dots}, y^{PATIENT}) < (\rightarrow_I s: y^{PATIENT})$

*Lex 22.* Lexical entry for the transitive German *kritzeln* 'scribble'.

This licensing condition excludes the other two types of events, namely (i) uncontrolled happenings and (ii) uncontrolled reflexes. Indeed, in a scenario in which the eye lid reflexes of people are tested (28a) is not acceptable. However, uncontrolled happenings as in (28b,c) do sometimes occur in the intransitive verb passive.

- (28) a. Es wurde überall gezuckt.  
'There was flinching going on everywhere.'
- b. In den Strafräumen wird zu oft gefallen.  
'In the penalty area there is too much falling going on.'
- c. Es wird ringsum gestorben.  
'There is dying going on all around.'
- (DWDS corpus)

What has not been noticed in the literature is that intransitive verb passives with these verbs occur in stylistically highly marked contexts. (28b) conveys that too many players pretend to have been fouled and clearly has an ironic meaning. What is meant is that they threw themselves down in order to obtain a penalty kick. As with other cases of irony, this can be explained by conversational implicatures and doesn't affect the licensing condition for the intransitive verb passive. Finally, (28c) can only occur in a particular stylistic setting. The sentence functions as an emotional carrier of a message which deemphasizes any causes or circumstances of the dying and completely focuses on the dying as such. That stylistic effects can be obtained by violating otherwise valid rules in particular ways is common and does not disprove a rule that holds in stylistically more neutral contexts.

#### 4.3. The duration of events

The distinction between reference to durative versus punctual events has proven crucial in several empirical domains of lexical semantics. As we

have seen in sections 3.1.1 and 3.1.3 it is involved in the licensing conditions for the *an*-construction and for the progressive. Furthermore, aspectual adverbials like *for five minutes*, *in five minutes*, *at that moment* and aspectual verbs like *start*, *stop*, *continue* interact in different ways with the durative-punctual distinction (cf. Engelberg 1999b, 2004). It has also been argued that punctuality is a parameter in determining whether inchoative verbs in German occur with an expletive reflexive pronoun or not (Oya 1996) and that the formation of nominalized infinitives in German relies on this parameter (cf. Blume 2004: 66ff.).

The notions 'durative' and 'punctual' appear as predicates over events within Lexical Event Structures. The interpretation of these predicates seems to be straightforward within temporal logic: an event is durative iff its run time maps onto an interval and it is punctual iff it maps onto a temporal point.<sup>23</sup> Yet, most verbs marked as punctual are not entirely lacking in duration. Events as referred to by *break*, *jump*, *belch* or *knock* take up some amount of time, miniscule though it may be. In other words, these events do not occur at temporal points, a fact which has been observed before.<sup>24</sup> In an early account, Pott (1859: 178) assumes that for aspectual verb pairs in Slavic and pairs in German like *sitzen* 'to sit' / *sich setzen* 'to sit down' one can discover "[...] that in these pairs reference to the same kind of temporal property is made, which involves – to illustrate the matter briefly and aptly by borrowing a spatial metaphor – whether they are thought of as being *punctual* in their duration (which, of course, is impossible in the strongest mathematical sense and therefore only relatively true) or as being *linear*."<sup>25</sup> More recently Platzack (1979: 93) remarks that punctual events are those, "that do not last in time (or rather, are not conceived of as lasting in time)", and Moens (1987: 102) claims that "[...] processes and culminated processes can be »compressed« into points. This [...] does not mean that they cease to have a temporal duration, but rather that their internal structure is no longer of importance."

<sup>23</sup> The remainder of this section is a slightly modified version of section 6.2 in Engelberg (2004).

<sup>24</sup> For the history of the punctuality concept in verb semantics cf. Engelberg (1999b).

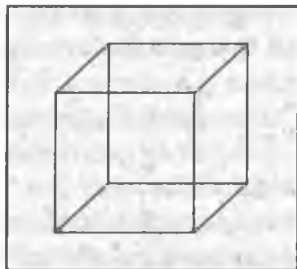
<sup>25</sup> My translation of: "[...] in beiden Rücksichtnahme auf eine gleiche Eigenschaft der Zeit, nämlich danach, ob sie – um die Sache durch ein vom Raume entlehntes Bild in Kürze und schlagend zu veranschaulichen – ihrer Dauer nach punktuell gedacht wird (was freilich in strengster mathematischer Strenge unmöglich und demnach nur beziehungsweise wahr), oder linear."

It is obvious that these remarks don't explain what 'punctual' actually means. In particular, they leave us with two questions. Firstly, why should we conceive of extremely short events as events without duration, or, in other words, why should we deceive ourselves about the true duration of events? Secondly, why do languages rely so heavily on a distinction between events that do not last for more than a couple of seconds and those which last longer?

In the following, I will show that a cognitive basis for the distinction between short and long events can be identified. Research on cognitive time concepts reveals that a short interval of 2 to 3 seconds plays a crucial role for perception, behavior, and speech production. The following phenomena involve this three-second interval which I will refer to as the 'cognitive moment' (Engelberg 1999a):

- (i) *Errors in the estimation of the length of intervals*: Experiments show that the length of short acoustic or visual stimuli is overestimated while the length of long stimuli is underestimated; the threshold between over- and underestimation lies between 2 and 2.5 seconds (Pöppel 1978: 723f).
- (ii) *Oscillation of extremely faint sounds*: Faint, barely audible acoustic stimuli like the ticking of a watch held some distance from the ear are only perceived periodically; the rhythmic appearance and disappearance of the sound perception occurs every couple of seconds (Urban-tschitsch 1875).
- (iii) *Rhythm of metronome beats*: Regular metronome beats of equal acoustic quality are perceived as units of two (or more); this "tick-tock" effect disappears if the distance between two beats exceeds about 2.5 seconds (Wundt 1911: 6).
- (iv) *Oscillation of ambivalent patterns*: The perception of ambivalent patterns like the Necker cube in fig. 3 oscillates between the two readings of the pattern at least every three seconds or so; to a large degree this occurs independently of the will of the observer (Pöppel 1985: 56ff).
- (v) *Distance between pauses in speech production*: Crosslinguistic investigations of spoken lyrics show a tendency towards rhythms with short pauses about every 3 seconds (Turner & Pöppel 1983). Comparable rhythms can be found in normal speech (Pöppel 1985: 71ff). An independent observation is that rhythmic pauses in speech cannot be explained by the demands of breathing rhythms (Handel 1989: 426).
- (vi) *Rhythm of actions*: Intercultural investigations show that simple actions like scratching, hand-shaking, knocking, chopping a tree, waving, or

hammering tend to be bundled into rhythmic groups with a length of two to three seconds, interrupted by short breaks (Feldhütter, Schleidt & Eibl-Eibesfeldt 1990).



*Figure 3.* Necker cube: the drawing is ambiguous as to which of the squares is perceived as front side of the cube.

The cognitive moment or “subjective present”, as this interval has also been called, is determined by a neural mechanism that integrates successive events into a perceptual gestalt whose duration is restricted to an upper limit of about three seconds (Pöppel 1985: 53). This gestalt creates something like a “window of consciousness” that induces a “feeling of now-ness”. Since the perception of events and the structure of our own actions is determined by the cognitive moment, it can be assumed that our general cognitive concept of events involves a classification of events that is mirrored in the way we use verbs to talk about events: punctual events are events that do not take longer than the duration of the cognitive moment, while durative events exceed this three-second interval.<sup>26</sup>

Since this concept of punctuality is by and large based on the perception of events, its relevance for concrete, perceptible events is obvious. However, many verbs referring to perceptible events in their basic reading (29a) also have metaphorical readings (29b). With respect to the *an*-construction (cf. section 3.1.1) both the literal and the metaphorical reading behave the same. Although the *an*-construction was said to be sensitive to the punctual-durative distinction, the claim that the denoted event in (29b) is punctual may be hard to defend in light of the fact that it doesn’t preserve the

<sup>26</sup> This concept of punctuality does not exclude temporal points in a logical sense from being employed in lexical semantics. I just claim that temporal points in a logical sense cannot be used in explaining the phenomena presented in this chapter.

temporal structure of the basic reading completely. Splitting a party can take more time than just a couple of seconds.

- (29) a. Sie spaltete das Brett / \*an dem Brett.  
'She split the board / was splitting the board.'  
b. Sie spaltete die Partei / \*an der Partei.  
'She divided ("split") the (political) party / was dividing the party.'

Thus, if we conceive of the basic reading of a verb as being the reading in which the verb refers to a concrete event that is immediately perceptible, we can call those verbs punctual or durative which refer to punctual and durative events respectively in this basic reading.<sup>27</sup> More precisely, we call those verbs punctual which refer to events whose only subevent (e. g., intransitive *break*) or whose caused subevent (e. g., transitive *break*) is punctual in the basic reading of the verb. Thus, the *an*-construction is not restricted to verbs referring to non-punctual events only, but rather to non-punctual verbs in the sense just defined (cf. Engelberg 1999a).

## 5. Conclusion

The paper was mainly devoted to the following questions: How do we conceptualize events and how is this reflected in language? The answers to these questions lead to an event-based theory of verb meaning. I have argued for a conception of a lexical-semantic theory which is not heavily restricted with respect to the semantic structures it employs, but instead imposes strict demands on the clarity of the metalinguistic concepts used in the representations. It has been shown how a better foundation of crucial semantic concepts in empirical cognitive science might help to avoid semantic "autoimmune" systems in which syntactic structures are predicted from lexical-semantic properties and the occurrence of these syntactic structures is at same time used to show that the licensing semantic properties must be present.

<sup>27</sup> This behavior of verbs with respect to the *an*-construction is reminiscent of the behavior of verbs which have a physical and a psychic reading, e. g. German *kratzen*, (i) 'scratch', (ii) 'worry, concern'. Klein & Kutscher (2002: 20ff) show that it is the physical reading which determines the valency pattern. They attribute this behavior to a principle of Lexical Economy which among other things says that for each verbal lexeme there is one reading which is decisive for its valency pattern.

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